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California Garden

FORTY-FOURTH YEAR SUMMER, 1953 VOL. 44, NO. 2

Have the hucksters taken us in again? Apparently so, according to this scholarly treatise by Mr. Quintana, who shatters our confidence in the pretty green stuff.

Chlorophyll

Frank C. Quintana

During the past year or so Americans have been made aware of this omnipresent material to a degree, perhaps, never before equalled in our history. Each of us has been instructed that chlorophyll solves an ancient problem besetting Homo Sapiens, the fact that he is condemned to smell like a human being. The Admen have enjoyed an old-fashioned clambake in presenting their claims, counter-claims and proofs-positive. It is a bit of a shame that their frenetic efforts should be dealt a blow by the happy little rune that appeared in the News Edition of the American Chemical Society, to wit:

Why reeks the Goat
On yonder Hill,
Who seems to dote
On Chlorophyll? ? ?

It might have been this quatrain that caused a group of chemists at the Glasgow University, under the direction of J. C. Brocklehurst, to report in a current British Medical Journal that chlorophyll has no deodorant properties whatsoever. These canny Scots bubbled mercaptan gas (a stinker, I can assure you) thru tubes of chlorophyll and thence thru iodine. Efficacy of the deodorant power was measured by the time it required to react chemically with the iodine. These chemists found that water alone was as effective as the chlorophyll. While this experimental device eliminated the human element, it was further confirmed by methods depending upon a sense of smell.

Chlorophyll is indeed an intriguing substance, and for many years has been receiving the attention of scientists engaged in an intensive effort to solve its various mysteries. It has long been known, for example, that plants reverse the matter of respiration as it occurrs in animals by the expedient of "breathing-in" carbon dioxide, and "exhaling" oxygen. We have all been subconsciously grateful to the green plants for this service rendered us, but no one was truly certain as to how it was accomplished. It was always suspected that the plant, in the course of its photosynthesis reduced carbon dioxide and somehow released part of the oxygen contained in that compound.

As the radio-active isotopes of the various elements became more readily available, it was possible to examine, in an unimpeachable manner, the exact source of this oxygen so released. Studies in bacterial photosynthesis suggested the possibility that the oxygen released had its source in the decomposition of water. If this were the case for bacteria, it seemed reasonable to test the hypothesis for green plants.

As far back as 1940, this theory was put to test. Cells of *Chlorella* were placed in water containing heavy oxygen atoms. That is to say, this was not normal water, but water that was labeled with radio-activity, and the labeled atom was the oxygen atom. Normal carbon dioxide was admitted to the suspension, and illumination was provided. The oxygen which was liberated by this photosynthesis was found to be labeled with heavy oxygen. The experiment was then reversed, so that carbon dioxide having a heavy oxygen labeling was used together with normal water. The oxygen obtained in this second photosynthetic reaction did not possess radio-active labeling. In this way it was demonstrated that the oxygen liberated in photosynthesis is derived from the oxygen atoms of water rather than the oxygen atoms of the carbon dioxide molecule.

About the same time, it was discovered that the chloroplasts could be removed from the plant cells, and when illuminated, would produce oxygen. Carbon dioxide was not at all necessary for this reaction, nor was it fixed in this reaction. Four ingredients were found requisite to obtain the release of oxygen: light, chloroplasts, water and an electron acceptor. This last class of substance is one which would permit the decomposition of water to pro-

ceed by accepting the electrons produced in the photosynthesis.

These experimental triumphs, and the work that has been going forward under the direction of Melvin Calvin, professor of Chemistry at the University of California at Berkeley, tend to prove conclusively that the matter of the reduction of carbon dioxide is a secondary phase of the photosynthetic process. The role of carbon dioxide, or, perhaps more properly carbon, in photosynthesis is being thoroughly studied by Calvin's group. These people are using a radio-active carbon dioxide, where the carbon atom is the active isotope, and with this tool they are charting the course of the plant's systematic manufacture of its essential components.

Investigations on the subject of photosynthesis are going full blast in several laboratories in the nation, and there are a number of controversies in connection with them. There is quite an argument at the moment about the exact amount of light energy required to initiate the chlorophyll reaction. There are those who maintain that only one quantum (a unit of light energy) is necessary, and others who insist that no less than eight or 10 quanta are required. This may appear to be hair-splitting, but the investigators are so close to the heart of the matter that these discussions take on a significant importance.

From the point of view of a layman, perhaps the most singular and interesting fact about chlorophyll is the matter of its chemical structure. Permit me to explain this term, "chemical structure," The knowledge of the nature and number of atoms comprising a molecule of any substance is not always sufficient data to permit total description. There are numerous cases wherein one or more compounds of different behavior and different properties appear to be composed of precisely the same kind and number of atoms. The only explanation for their varied physico-chemical properties is due to the arrangement of the atoms within the molecule. Thus, the molecular architecture — or chemical structure—is a most important study.

The green pigment, chlorophyll, belongs to a group of chemical structures called porphyrins. It is a large and complicated molecue having a distinctive molecular pattern. A startling relationship is shown by the red pigment of the blood of animals, hemin, which is also a porphyrin, and which is structurally similar to chlorophyll in many respects. To go further, the blue pigment of the blood of lobsters, and the orange pigment of the blood of certain sea worms are also porphyrins, and exhibit similarities in chemical structure to chlorophyll and hemin. Please understand that all pigments are *not* porphyrins—these very specialized substances mentioned above do all contain this unifying characteristic; they are all of the porphyrin group.

It is certainly fascinating to observe that these very similarly constructed substances should be essential to life in such widely different forms of living matter. This fascination is intensified when one recognizes the existence of myriads of chemical compounds. How is it that such widely different phylla as plants and animals should depend for their very existence on compounds of such great similarity? To muddy the waters a little more, there is even a stronger relationship from a functional point of view. Both types of pigments are primarily concerned with the chemistry of water. The red pigments (the hemes) function to catalyze the formation of water (oxidation) while the green pigments (the chlorophylls) function to catalyze the decomposition of water (photosynthesis).

Actually, the knowledge of the structural relationships of these materials is nothing new. The notion that these major pigments of protoplasm were somehow related arose during the 19th century at a time when very little of the chemistry of these materials was known. It has taken some 50 years of intensive chemical research to establish the structures of one important member of each of the pigment groups. In 1931 Hans Fischer received the Nobel Prize for his excellent work in synthesizing hemin. This synthetic material was in every respect identical with the natural substance. To the best of my present knowledge, chlorophyll has not yet been synthesized in the laboratory.

In an article entitled "Chlorophyll and Photosynthesis" by Granick of the Rockefeller Institute for Medical Research, a report is given of the most recent developments in the studies on chlorophyll, and its relationship to hemin. It was this article (and the persuasions of the editors) that prompted my attempt here to render his stimulating discussion in a more comprehensive form for the layman. The material which is to follow is about as un-technical as possible, for, while it is in the extreme, it is dependent upon technicalities.

By 1940, the methods of organic chemistry had established the similarity of the structure of hemin and chlorophyll, but the significance of that similarity remained to be examined. This required a bio-chemical approach, that is, a study based on the chemical behavior of living tissue.

In the past 30 years an important concept has developed, the concept of the bio-synthetic chain. Briefly, the concept is this: if a

cell manufactures a specific compound, such as chlorophyll, it will use as its elementary building blocks those simple organic molecules which are a part of its basic metabolism. In the business of making the final complicated product, it will put these building blocks together, not all at once, but step by step. In this way, the manufacture will proceed thru a series of intermediate steps.

The bio-synthetic chain is perhaps analagous to the assembly line. Each intermediate will be converted by a specific enzyme to the next intermediate. Normally, the conversions of the intermediates 1 to 2, and 2 to 3, and so on, take place rapidly, with the result that only extremely small amounts of any or all of the intermediates are present at any one time. Thus, chemical procedures cannot isolate clues to the green plant's method of synthesis. In addition to the specific substrates (intermediates) and the specific enzymes, the concept includes specific genes. These individualized genes may be considered to govern the formation of the individual enzymes. Thus we have a pattern: Gene 1 governs the formation and activity of Enzyme 1, and this enzyme performs the work that makes Intermediate 1.

From the above assembly line analogy, it was shown that the intermediates were passed along the chain rapidly, and were present in undetectable amounts. It was necessary to find a way to make the organism accumulate large enough amounts of the intermediates to permit isolation and identification. From our knowledge of genes and genetics, this was possible. It is known that the various genes can be inactivated or destroyed by treatment with X-rays or ultra-violet light. If this whole bio-synthetic chain idea were true, some gene in the chain could be eliminated, and then, because there would be no passing along of the product from the previous enzyme in the assembly line, a pile-up of the intermediate should occur. In this way, artificially produced mutants could be made, and as any plant geneticist knows, the gene damage is inheritable.

Experiments were performed and were successful. CHLORELLA, a unicellular algae, was used, and among the mutants obtained one was red-brown instead of the more usual dark green. Upon examination, the pigment that produced this red-brown color was found to be protoporphyrin isomer #9, a porphyrin identical in structure with the protoporphyrin portion of the heme of the red blood cell. Other mutants isolated provided more information on the green plants' synthesis of chlorophyll, and from this data an excellent picture of the total synthesis is being prepared.

When the work was begun, it was hoped that there might be some resemblance between the steps of the hemin and the chlorophyll synthesis. Actually, it turned out that the steps are identical. Hemin, synthesized in the red blood cell of the animal, is being synthesized along the same bio-synthetic chain, through the same intermediate compounds as is the protoporphyrin in the chloroplasts of the plant. Thus, the relation between the two pigments has been clarified after 100 years of questioning. These pigments are related in that they are products of the same bio-synthetic chain.

I cannot help but be bemused by this research: if hemin of the red blood cell is an intermediate in the plant's manufacture of chlorophyll, could it be that the plant is a higher evolution? Perhaps the gardener should be more solicitous of the welfare of his superiors planted in his garden.

Mr. Fleming is following the calendar in Torrey Pines Park, and in his second installment shares the summer beauties of this natural reserve.

Torrey Pines Floral Show

GUY L. FLEMING

In this issue of CALIFORNIA GARDEN we introduce to our readers the summer flowering and fruiting plants that attract our attention as we explore the trails of Torrey Pines Park during the months of May, June, July and August.

You will recall that an exceptional characteristic of the Torrey Pine is the fact that its cones require three seasons of growth to attain maturity, therefore the baby cones of January, 1951, will be ripe, a dark mahogany brown in color, in late May or early June and begin then to discharge their seed.

Visitors to Torrey Pines Park must not be tempted to cut or break the cones from the trees. Nature must be given an opportunity to perpetuate this rare species of pine. The Rules and Regulations of our City Park system prohibit seed collecting or cutting plant material in our parks unless written authority has been granted by the Director of Parks.

During the month of June we may see a late blooming member of the Lily Family, *Calochortus weedii,* Weed's Mariposa Lily. The deeply-placed bulb of this lily usually grows in association with low shrubs and sends up a stem one to two and a half feet high through the protective shrub cover. Each bulb produces flowers over an inch long, with lemon yellow petals nearly covered with long silky hairs, each set in a small dark spot.

When the Spanish explorers arrived in California in 1769 they found a dwarf oak growing here which they called "chaparro" for it reminded them of a small evergreen oak of the plains of Spain. Groves or thickets of these oaks were designated chaparral. So today we call all of the shrub cover —the elfin forest of the Southwest—chaparral. Our dwarf oak, *Quercus dumosa,* is an interesting evergreen extremely variable in its leaf texture, outline, and in the character of its acorns, both cup and nut. This small tree is an ideal native to introduce into the home garden.

Three members of the Buckwheat add interest to our summer display. One is the genus *Chorizanthe,* pronounced kory-zanthe, species *staticoides.* Miss Kate Sessions gave this native annual the name "Turkish Rugging," which properly fits this mat-like and colorful plant of our sandy plains and hillsides. The second member is *Eriogonum parvifolium,* a combination of Greek and Latin words and literally translated "woolly joints with small leaves" and pronounced erie-og-o-num parvi-folium. The Seacliff Buckwheat is a somewhat rare species found along the sea-frontage of the park. It is a small, spreading shrub one to three feet high with somewhat oval leaves, dark green and shiny above, white with a felt-like covering below, flowers pinkish white in small clusters. The third member is Eriogonum fasciculat-um, one of our choice shrubs and commonly known as "Wild Buckwheat." These natives are among the dominant plants of our mesas and canyons. They are semi-erect bushes sometimes attaining a height of six feet and may be 10 or 12 feet broad with many slender and flexible branches. Throughout the summer months these shrubs bear masses of pink or white blossoms with pink anthers. As the flowers mature they become red-brown, carrying the decorative qualities of the Buckwheat well into October. Specimens in the park cascade many feet down over steep slopes creating a striking floral display.

The Stonecrop Family is represented by three members of the genus *Echeveria,* Live-for-ever. *Echeveria pulverulenta,* Chalk Lettuce, develops a large rosette of pulverulent (chalky-white) leaves, from which ascend stems one to three feet tall that terminate in two to several racemes of bright red narrow flowers. *Echeveria lanceolata* is a plant with rosettes of green leaves and red flowering stems terminating in clusters of tubular red flowers. *Echeveria edule* produces a rosette of ascending, finger-like leaves, and many flowering stems bearing racemes of yellow-white flowers. This plant was used by the Indians, both raw and cooked, hence the specific name *edule* (edible). Our Echeverias are handsome natives worthy of a place in the home rock-garden.

The "elfine forest" of the park includes three members of the Rose Family. One, well known to the readers of CALIFORNIA GARDEN, is *Photinia arbutifolia,* Toyon, Christmas Berry. Although usually a large shrub it sometimes becomes a fair sized tree of over 20 feet in height. This native is evergreen with thick leathery leaves, dark glossy green above and light green on the underside. In late June it is covered with masses of creamy-white

flowers, borne in large terminal clusters. The Toyon was introduced into England and Holland 100 years ago, has been successfully propagated, and is today considered one of their choice garden shrubs. It adapts itself to ordinary garden culture, and can be used as material for a tall hedge, trained as a bank cover, or grown as a yard or street tree. Our second member of the Rose Family is *Adenostoma fasciculatum,* pronounced ah-den-os-toma fas-cic-u-latum. The specific name refers to the many, needle-like leaves. This heatherlike shrub is commonly called Greasewood, but the writer prefers the name Chamiso given to it by the early Spanish settlers. This shrub should be familiar to everyone for it is the predominant shrub cover of our foothills. In May and June, after a winter of ample rainfall, the Chamiso is snowy white with dense panicles of tiny flowers. The third relative of the rose is *Cercocarpus minutiflorus,* the Small Flowering Mountain Mahogany, which has its westernmost habitat in Torrey Pines Park. This interesting tree-shrub is called Mountain Mahogany because of its fine-grained mahogany colored wood. It is a much-branched tree growing to a height of 20 feet or more, very open and upright with crooked, stiff branches, to create an effective outline against the blue sky. The clusters of small flowers fill the air with fragrance at blossoming time and later develop seeds which bear long silvery plumes. The numerous feathery plumes give the tree a silver halo when viewed against the sun. This is another hardy native for home gardeners who seek small trees that require little water during summer months. It will form effective tracery for a sunny wall or fence.

Lotus scoparius, Deerweed, is a member of the Pea Family. It is a spreading subshrub, two or more feet high, with long slender greenish branches, light green foliage and numerous small pea-like blossoms. Another member of the Pea Family is *Astragalus leucopsis,* pronounced ast-rag-alus lew-cop-sis, Rattleweed. This plant grows to a height of one foot or more, with many stems which bear pale yellow flowers. The seed pods are bladder-like, thin skinned, and when dry rattle like the subdued buzz of a rattlesnake.

An interesting member of the Box Family is *Simmondsia californica,* Deernut, or Jajoba, pronounced ha-ho-ba, (the Indian name for this shrub). We find the westernmost mainland stand of this desert type shrub growing on the steep, seaward slope near the foot of the old Torrey Pines Grade. This is a true relic of a past age when desert conditions prevailed in our coastal area. Our "relic" comprises a growth of low, creeping shrubs covering an area about 25 by 75 feet, whereas, in the arid region of the Colorado Desert and in Arizona and Lower California, Simmondsia is a large shrub over five feet high and many feet broad.

Two outstanding tree-shrubs of the Torrey Pines area belong to the Sumac Family. *Rhus laurina,* Laurel Sumac, California Sumac, is a large shrub, or small tree, with red-brown branches and dark green foliage. During the summer months it displays panicles of creamy-white flowers, and after the flowers pass by, red-brown clusters of small flat seeds maintain the decorative quality of the Sumac. In the springtime, or following judicious pruning, this shrub is gay with a colorful array of new growth, the young twigs and foliage ranging in hue from rich mahogany-red to a bright cherry-red. California Sumac's place in the home planting is where tall background masses are desired, or as effective cover for dry slopes. *Rhus intergrifolia,* Lemonade Berry, may be observed as a low creeping shrub, and in protected locations it may become a small tree over 20 feet in height with a trunk diameter of over two feet. The name Lemonade Berry has been applied to this plant because its fruit, a flattened drupe, is covered with a sticky, extremely acid covering. A small handful of these seeds stirred in a pint of water, with a little sugar added, makes a very refreshing, lemon-like drink. This Rhus is a very attractive native with dark-green leaves. In late spring it produces masses of small pink flowers in clusters at the end of the stems. The fruits, described above, become pink or dark red in color in June and remain on the shrubs for weeks. This plant is certainly one of the best natives for home planting. It will adapt itself to general garden culture, and by pruning it can be trained into a low ground cover or into a broad-crowned tree.

Ceanothus verrucosus, pronounced see-an-oth-us ver-ru-cosus, Wartystem Ceanothus, is a member of the Buckthorn Family, The flowering period of this large shrub is in January and February, when it produces a snowy mass of white blossoms. It is introduced in the summer list of plants because of its pleasing dark gray-green foliage and red-brown seed capsules. Another member of the Buckthorn group is the Redberry, *Rhamnus crocea.* This is a low densely growing shrub one to three feet high with small glossy green leaves and bright red berries. Redberry has been used as a low hedge in garden culture. The red berries, partly hidden among the small leaves, gives these shrubs a striking appearance from July to September.

(see page 15)

What are your theories on growing a lawn? There must be a great many, but none more logical than Henry's.

Leaves From The Observer's Notebook

MARION ALMY LIPPITT

Henry and our black cocker spaniel, San D, were sitting side by side on the garden bench. They both looked long-eared, sad-eyed, and quietly dignified. San D contemplated the landscape dreamily while Henry scanned the newspaper in a desultory manner. The weekly lawn mowing had passed the halfway mark, and Henry was taking a breather. Suddenly, as if stung by a passing bee, Henry emitted a sound somewhere between a yell, a cough, and a growl, and threw the newspaper on the grass. San D sprang to attention with squirrel expectancy in his eyes and his tail revolving in rapid cocker RPM's.

From my comfortable position in the swing I viewed the demonstration over my book. Realizing Henry was bursting to tell somebody something, I said:

"How-now-brown-cow?"

"It's these armchair landscape gardeners that get my goat!" Henry blurted in disgust.

"Listen to this." He rescued the newspaper and read the following from "The Landscaping Column:"

"For restfulness a stretch of green lawn is best." The remainder of Henry's calm dissipated itself in gesticulations and subdued into "I'd like to put a spade in that gal's hand and start her from scratch."

"How do you know it's a she?"

"Because no man would recommend such a trouble-breeder."

"Who planned the new Veterans War Memorial Building in Balboa Park with its expanses of lawn?" I questioned mildly.

"Some apartment-dweller who doesn't cut grass for a living," answered Henry in clipt tones.

"Think of the employment it provides," I said, turning the page in my book.

"There's b e t t e r employment than wasting precious water in a dry country." Here Henry looked particularly long-eared and sad-eyed.

"Admit," I said, "that the lawn makes a beautiful setting for the building."

Henry glanced from side to side, seeking a way of escape. With reluctance he nodded affirmatively.

"And it is restful," I persisted.

This time Henry looked completely trapped. Recognizing his position, at last he smiled broadly. The smile came out of the file marked "Smile guaranteed to disarm any opponent."

"It is delightfully r e s t f u l," vouchsafed Henry, his voice as smooth as rayon.

Having won my point I felt magnamious. In order to soften my victory I began to praise his past efforts.

"You see," I began, "it all depends upon the view angle. You were looking at it from the start of a new lawn. I remember how you first measured the lawn into large squares. You dug each square down two or three inches, and piled the soil aside; then you dug another five inches piling that dirt in another corner. Finally you attacked the remainder with a large pick.

As I warmed to my subject I closed my book.

"Then," I went on, "you put the piles of dirt back in sequence in their respective squares, and were at last ready to seed the lawn."

"Everyone has his own formula for grass seeds," offered Henry. "I say pick out someone's lawn you admire and ask him what he used. It's as good a way to start as any."

While Henry was speaking he rummaged through his pockets until he found a pen knife. He opened it and stuck the blade into the ground to the hilt. He pulled it out, stood up and examined the blade carefully. Then he wiped it off on his trousers and returned it to his pocket.

San D and I watched him with undeviating attention.

When he turned about and started for the tool room, San D followed him unquestioningly, but my curiousity rose to feminine pitch.

"Where are you going, and why?" I enquired.

"To get the hose, to water the lawn, to make the grass grow, to be able to cut it again."

"Then you dig-a-da-ditch, to getta-da-mon, to buy-a-da-bread, to getta-da-strength, to dig-a-da-ditch?" I quizzed.

"Same idea," replied Henry laconically.

"How do you know the lawn needs water?"

"You make your decision according to the condition of the knife blade. Dry, you water. Moist, you don't."

Henry continued on his way.

"It's wonderful to be married to a man who knows all the answers," I called after the retreating picture of a man and his dog. To myself I repeated Josephine Johnson's charming lines:

"Then lifting high each shining
sword
The grass stood up and praised
the Lord."

A. C. Tarjan, in this reprint from "Organic Gardening," describes that dread omnipresence, the nematode, and lends hope by telling how to control the eel-worm.

Nematodes and Their Effects on Plants

A. C. Tarjan (R. I.)

In a world where numerous organisms are competing constantly with each other for life, we humans usually are acquainted with only those organisms which have a direct bearing on us or our way of life. Invariably we have a better knowledge of plants and animals that are capable of being observed by the naked eye. During the last two centuries, however, considerable interest has been shown concerning microscopic organisms such as bacteria, fungi, and smaller animals which usually are visible only with the aid of microscopes. As more and more trained scientists conduct research with these microorganisms, we acquire additional information as to how and why they affect us and our possessions. One specialized group of microorganisms which play a very important role in nature are nematodes or eel-worms with which we may unknowingly come into contact each day of our lives.

Nematodes usually are quite minute, being as small as 1/125 of an inch in length but also measuring up to a yard long as in the case of certain animal parasites. Although most abundant in tropical areas, they nevertheless occur in sizable numbers in all other parts of the world.

The Plant-parasitic Nematodes

Perhaps one of the most alarming facts about the many nematode species that attack plants is that they have been greatly underrated as to the amount of damage they cause. This is understandable since personnel trained in this highly specialized branch of plant pathology have been extremely few. Consequently plant diseases caused by nematodes have often been incorrectly diagnosed as being caused by other parasites or thought due to unfavorable growing conditions. More and more we are becoming aware that "winter injury" and "unfavorable soil conditions" are merely expressions of nematode injury.

Among the more common of the nematodes attacking aerial parts of plants is the chrysanthemum leaf nematode. This eel-worm causes dead wedge-shaped areas on the lower leaves of plants and is capable of completely defoliating plants if infection is severe enough. Other serious nematode pests of above-ground parts are the wheat nematode, which has been known to cause destruction of as much as 80 per cent of a wheat crop, various bud nematodes which cause "blinding" and a typical growth of buds and shoots, and the bulb and stem nematode which is a serious parasite of commercial flower bulbs and other crop plants.

The greater majority of plant-parasitic nematodes are root parasites and do not cause specific symptoms of injury on above-ground parts of plants. These symptoms are usually an unhealthy condition in which plants grow poorly and frequently have a stunted appearance. On hot summer days nematode-infected succulent plants tend to wilt more rapidly than healthy plants but usually recover when temperatures become cooler. Yellowing of foliage and "die-back" of branches or shoots may also be a common occurrence with such infections. Since there are also a number of free-living, non-parasitic nematodes usually associated with root systems of many plants, the finding of a number of nematodes is not always an indication that plants are suffering from nematode injury. Along the same lines, the presence of root-pathogenic nematodes is not always an indication that plants are suffering solely from nematode injury since many other micro-organisms especially root-pathogenic fungi, can cause serious root injury.

This method, by which root-parasitic nematodes cause injury, is not yet fully understood. These parasites almost all contain a short spear in their head ends. This spear is inserted into root cells and the nematodes feed on the contents of the cells. Although a relatively small number of nematodes feeding in this manner seldom cause much injury to the plant, these parasites multiply rapidly and the plant soon suffers from the continued feeding of increased numbers of them.

Among the more common root-parasitic nematodes found in variout soils are the root-knot nematodes which cause the formation of numerous galls or knots on roots of several different types of plants. The formation of these knots greatly hinders the production of a normal root system and plants become stunted and grow unsatisfactorily, failing to set fruit or doing so poorly. These nematodes are found firmly embedded in root tissues and produce numerous eggs in small, yellowish egg masses which dot the surface of the galled root.

The golden nematode of potatoes is assumed to occur only on Long Island, New York, in the United States. In parts of eastern Europe, it has reduced some potato crops drastically and is con-

sidered one of the most destructive disease pests occurring in those regions. Fortunately, the quarantine restrictions which the U. S. Department of Agriculture placed on Long Island potatoes seem to have been effective in confining the further spread of this parasite in America.

The infamous meadow or root-lesion nematodes are recognized as virulent plant parasites in many parts of the world. These pests penetrate and induce rotting of feeding roots so that the victimized plant is left with a greatly reduced root system. They apparently are well distributed in the United States and parts of Canada, having been found on a variety of woody and succulent crop plants.

Whereas the root-knot nematodes, golden nematodes, and meadow nematodes are normally found partially or completely contained in root tissue, there are a considerable number of other root-parasitic nematodes that are attached only superficially to roots on which they feed and are readily dislodged once the roots are disturbed. Among these are the dagger or needle nematodes which have been found in large numbers in the eastern United States and the spiral nematodes which are well distributed throughout the entire country. It is the opinion of this writer that a great deal of the decline of hardwoods and softwoods seen particularly in late summer may be due to infections by these nematodes and related types. In the early part of the growing season when conditions are suitable for good plant growth and the numbers of these nematodes which overwintered in the soil are small, trees will grow satisfactorily and appear quite healthy. Once adverse conditions such as mid- and late-summer droughts occur and trees are supporting greatly increased populations of nematodes, symptoms of decline such as death of limbs, abnormal coloration of foliage, and premature leaf drop may appear. It should be kept in mind, however, that fungi and insects can also cause identical symptoms.

A typical case of plant injury that may be caused by nematodes was brought to the writer's attention in the fall of 1951. Various strains of red clover as well as other leguminous crops in a large field of several acres had been declining. Symptoms of poor growth and discoloration of foliage were in evidence primarily on two-year old stands. Inspection of affected plants for signs of fungus injury had not consistently indicated the presence of plant-pathogenic fungi. Root systems of affected plants were reduced and contained a number of dead or dying rootlets. Inspection of soil and roots from a considerable number of affected plants consistently showed the presence of large numbers of a certain type of nematode bearing the imposing scientific name of *Pungentus pungens*. From previous cases on record, these nematodes are suspected of being plant parasites, consequently experiments are now in progress to determine whether they actually are capable of causing injury to clover plants.

Up to this point nematodes have been discussed as parasites actively feeding in plant roots. There are a large number of these pests, however, that cause a great deal of damage merely by creating openings through the puncturing of root surfaces with their spears. It is through these openings that other microorganisms enter which also cause roots diseases. It has been shown definitely that diseases such as Fusarium wilt of gladiolus and cracking of sweet potatoes are more prevalent when certain root-parasitic nematodes are also present in the soil. Many times, nematode infections will so greatly reduce the vigor of plants that they easily succumb to infection by other parasites or are killed by unfavorable growing conditions.

In any consideration of plant-parasitic nematodes it should be pointed out that these creatures are capable of causing their greatest damage to plants when conditions of moisture and temperature are favorable. Whereas nematodes are most active in soil suitable for germination of seed and subsequent growth of plants, considerable numbers of some of them may be killed by flooding the soil for extended periods or by permitting soil, such as on greenhouse benches, to dry completely. Nematode activity diminishes rapidly as temperatures are lowered. This is the principle under which a profitable crop of lettuce, which can be grown in cooler temperature, is cultivated on root-knot nematode-infested soil. Freezing of the soil is of little value for reducing the nematode population contained within. The writer personally has thawed out roots and soil frozen for considerable periods of time and found plant-parasitic nematodes of different types active and apparently none the worse for their experience. Higher temperatures, on the other hand, can be extremely detrimental to nematodes. Without a doubt, the sun often plays an important role in eliminating a considerable number of nematodes by continued baking of the upper soil layer. Some nematodes, however, are prepared for adverse conditions and go into a resistant stage or live over in protective egg shells. Even among those nematodes which are not adapted to survive adverse conditions a few usually escape death among the many that perish, and these multiply rapidly once conditions again become favorable.

Methods of controlling namatode parasites of plants are constantly being improved. The continued recommendation for use of nematode-free planting stock may be extremely effective in reducing the introduction and spread of plant-parasitic nematodes, but is little consolation to growers who own fields infested with these parasites. Crop rotation is perhaps one of the most inexpensive yet effective measures on which we can rely. Nematodes, like other parasites, prefer certain types of plants to others. If a crop which is undesirable to plant-parasitic nematodes is planted, the parasites are starved and their populations in the soil reduced accordingly. Since certain types of nematodes thrive on several different crops, however, the grower should be certain that the substitute crop is not another on which the nematodes can feed and reproduce. This can be accomplished only by sending plant and soil samples for examination by competent personnel located in federal and state laboratories throughout the country.

Fertilization of infected plants induces the formation of roots and improves plant vigor thus masking the deleterious effects of nematodes feeding on the roots. Such improvements in plant growth are relatively short-lived, however, since root-parasitic nematodes can multiply rapidly and again cause plant decline once conditions become adverse for the plant.

When quantities of organic fertilizers are added to the soil around plants with roots parasitized by nematodes, growth of insects, nematodes, and fungi which prey on plant-parasitic nematodes is often encouraged. Although in the past such control methods have not been extensively investigated, they nevertheless are of the utmost importance in the natural control of nematodes and other plant pests and offer a sensible approach to such problems. Certain fungi, as an example, form specialized nets which are covered with an extremely sticky substance. Once the potential victim brushes against any part of these nets it usually is firmly caught. Other fungi form which immediately constrict if any part of the nematode body is inserted within the loop.

Two other methods of controlling plant-parasitic nematodes are by trap cropping and by the use of resistant plant varieties. The former method involves the planting of a crop, roots of which nematodes will penetrate for purposes of feeding and reproduction. Since certain nematodes can not leave roots which they have entered once they have started to complete their life cycles, plowing the crop thus killing the plants likewise kills the nematodes in the roots. Considerable work on the breeding of nematode resistant plants is now in progress. To date, advances have been made in the breeding of resistant tobacco and fruit trees.

Despite the large number of nematode diseases that currently are recognized and being discovered continually, more scientific research is being conducted on them and their control than ever before. The future holds promise of new developments in disease control that will benefit producer and consumer alike.

Dr. Atkinson encourages an improved soil, the key to healthy plant growth being a balanced nutrition.

Conditioning Soils

Robert E. Atkinson, Ph.D.
"the plant doctor"

The premise that good gardening depends on good soil was never more true than it is today. Our standards of plant and flower quality have steadily improved through the years, due to work of plant breeders and because of better cultural methods. The use of fertilizer has become a generally accepted practice, yet in many gardens the blooms which reflect the vigor and health of plants are poorer than those of the recent well-remembered past.

When one seeks to discover why this degeneration has occurred, the overwhelming number of theories, guesses and pet ideas are confusing. The great number of chemical fertilizers, organic fertilizers, vitamins, hormones and soil conditioners on the market add to the confusion. Epson salts (under a fancy name) and aluminum sulfate, a plant poison, are included in the nostrums foisted on the public. On the other hand, each of the materials developed and marketed by reputable companies has a definite function to perform in improving plants and soil.

With the myriad of materials available, it is important that the right material be chosen to meet your particular problem, and that it be used at the right time and in the right way. To help you choose and use these materials is the purpose of this article.

Balanced nutrition is the key to healthy plant growth. Before artificial fertilizers are added, soils usually have a fairly well-balanced supply. California soils are usually deficient in nitrogen so small amounts of this element are always beneficial. Thus organic fertilizers, manure and sludge types which release nitrogen slowly are the most satisfactory. The fact that they also contain a balanced supply of other major ele-

ments is an added advantage. If small amounts of inorganic elements are applied, the benefits are the same but of short duration. The disadvantage of inorganic nitrogen is the tendency to apply excessive amounts which gives the plants a sharp spurt of vegetative growth (leaf, root and shoot) and depresses flower and fruit production. This unbalance may also make the plants subject to certain diseases, especially those caused by rusts, mildews and viruses.

A balanced supply of essential minor elements is also important. Only a trace of iron, zinc, magnesium, etc., is needed. The most important cause of a shortage of these elements is alkalinity which renders these minerals unavailable to the plant. Correcting alkalinity usually releases these "trace" elements in sufficient amounts. In cases of prolonged deficiency, chlorotic leaves may be sprayed with a solution containing a mixture of these elements and they can be absorbed directly through the leaves. It is best to use a solution of all of these elements because iron deficiency symptoms, for instance, are difficult to differentiate from those caused by a lack of magnesium and other elements.

The greatest single change in the garden soil in recent years is the cumulative effects of the increasingly alkaline water used in irrigation. Continual watering with Colorado river water has made alkalinity the most common cause of planting failure. Of course the first plants to show distress are the acid-loving azaleas, camellias and gardenias. The first effect of alkalinity on roses is a fading of the color of blooms. Correcting soil reaction will often intensify color of blooms to a degree never before seen. Failure of bluegrass, bentgrass and dichondra lawns can often be traced to excessive alkaline salts.

Correction of soil reaction can best be obtained by the use of sulfur. The dry form is suitable for potting mixtures and for soil preparation when it can be adequately mixed with the soil. With established plants it is essential to use a liquid form of sulfur. This is a common agricultural practice which also aids drainage and adds to the friability of heavy soil.

The newest soil conditioners called polyelectrolytes help soil texture and have been cautioned by the government to claim beneficial effects only on clay soils. They must be thoroughly mixed with the soil to be effective. The good points of these soil texture conditioners have been obscured by many excessive claims.

The value of organic amendments such as peat moss, saw dust, shavings, and leaf mold is chiefly in adding humus to the soil. These materials have little or no value as fertilizers but are at least as good as the polyelectrolytes in improving soil texture. In addition, they increase the water holding capacity of the soil, benefit aeriation and "tilth"—all characteristics of good soil. Organic matter provides raw material for bacterial activity, an essential but often neglected aspect of soil fertility. The advent of antibiotics has given a scientific basis for many long-established principles of soil behavior. The Biblical injunction in Ecclesiasticus, for instance, "The Lord hath created medicines out of the earth, and he that is wise will not abhor them" is heeded by those interested in plant medicines.

The interaction of bacteria and fungi in the soil provides the living and ever-changing make-up of the micro-environment of the roots. Thus the tendency to turn to organic fertilizers for sources of nitrogen and for humus has a new basis in fact, and sulfur in liquid form, to counteract alkalinity, has a new importance.

Plumbago, illustrated here and on the cover, should be in everyone's garden, according to Mr. Hottes, our garden-artist who should know.

Plumbago and Cerato

Alfred C. Hottes

(Plum-bay'go, See-rat-o-stig'ma. Plumbago is the Latin word for lead, also a disease of the eye was so called, and for which a species of Plumbago was used. Ceratostigma is derived from *Keras,* a horn, refers to the horned stigma. Family Plumbaginaceae, related to Statice.)

Real blue flowers are always a rarity in our gardens so that we welcome the Ceratostigmas which differ from the true Plumbagos by having the flowers in dense clusters rather than spikes and with a calyx that is glandless.

Larpente Plumbago, *Ceratostigma plumbaginoides (Plumbago larpentae).* This is considered a hardy perennial by most persons but the wiry stems are woody. It is prostrate but builds up to the height of a foot. The flowers are deep blue with reddish bracts, produced in clusters on the ends of each branch. The leaves are obovate, which means that they are broader above the middle. This species was found near Peking by Bunge in 1831, and in 1846 Robert Fortune collected it near Shanghai and sent it to England where in 1847 Lady Larpente exhibited the flowers.

Burmese Plumbago, Griffith C., *C. griffithi.* This is a low-growing plant wider than tall, much-branched and covered with rusty hairs. The spatulate leaves have red margins. It comes from India and Burma, and as it grows in the mountains it is quite hardy, standing zero. In mild sections it is evergreen. The dark blue flowers come in autumn.

Willmott C., Chinese P., *C. willmottiana.* Hugh Evans introduced this from Kew Gardens. The plants have a loose, branching habit, and shed their leaves in winter. The branches are rusty hairy. Unlike the other two species, this plant grows three feet tall and wide. The bright blue flowers have a rosy tube, and are in bloom from July to November. The leaves are quite rhombic (rather angular oval), two inches long with a hairy margin, and turn red in the fall before shedding.

Uses. The Ceratostigmas should find a place in every garden because of their lovely and rare color. The Larpente P., as well as the Griffith P., are useful for rock gardens, for the front of a porch, flower borders, in fact any place where low shrubs are wanted. Used in a hanging basket, the branches drape down nicely.

Culture. They like sun or part shade, good soil, and water. Remember that the Griffith and the Larpente are both hardy to zero. Prune the plants after flowering about half way down; another pruning at the end of winter may be needed.

Cape Plumbago or Cape Leadwort, *Plumbago capensis.* This common rangy shrub comes to us from South Africa. The plants grow 12 to 15 feet tall. Although the branches are weak and almost like a climbing plant, they build themselves up into a great mass

Mrs. Ogden supplies color combinations as suggestions for a more interesting garden.

The Bi-Color Border

BERNICE OGDEN

The lazy method of gardening, and undoubtedly the one most frequently used by the amateur gardener, is to set out a hodge-podge of plants, letting colors fall where they may. The results of this lack of planning are often disappointing.

Your summer gardening can be more enjoyable if you use the common annuals in an uncommon way. Almost an endless variety of effects can be achieved by planned color combinations in your flower borders. One of the simplest ways to begin is to edge your flower beds with contrasting or harmonizing bands of color.

The new purple alyssum, "Royal Carpet," is low, compact, and attractive. It may be combined with the low growing white alyssum, "Carpet of Snow." Set two or more rows of each around a bed of pink or lavender asters and you will have something that calls for a second look. You may object to the alyssums because next season they may put in an appearance where they are unwanted. But they are shallow rooted and can easily be removed.

The dwarf orange-colored marigold harmonizes with the pigmy yellow marigold and either of these enjoys the company of blue ageratum.

Dusty Miller, a perennial, is an excellent foil for almost any low annual. The brilliant rose Lipstick petunia, scarlet verbena, blue lobelia—all combine with it most effectively. The soft grayish-white of the foliage of the dusty miller intensifies the color of its companion and makes a striking border.

For a border requiring partial shade, there are some lovely color combinations. The "Cambridge Blue" lobelia is pleasing with either dwarf pink or white begonias. It is also happy with the darker "Crystal Palace" lobelia Torenia, the wishbone flower, a delightful blue with a dot of gold, would enhance either the pink or the white begonias. Torenia could also be used with a low-growing mimulus which comes in a mixture of orange and yellow shades.

But make your own color patterns and you will enjoy them more. Work out a plan that is new to your garden. Try something different the following season. See how much variety you can achieve with a few well-known plants. In other words, have fun with bicolored borders.

of stems to make a mound of growth almost as wide as tall. The flowers are phlox-like, light blue, sometimes white. Whenever weather permits they are in bloom. Unlike that of Ceratostigmas, the calyx is furnished with sticky glandular hairs. The leaves are alternate, broadly lanceshaped, to two inches long, bunched at the nodes, some leaves smaller than others.

Rose Plumbago, *Plumbago rosea (indica)* and its scarlet variety Scarlet Plumbago, or Scarlet Indiancreeper, variety *coccinea.* These tender shrubs come from south Asia and were introduced into England in 1777. It is partly climbing. The leaves are oval and much larger than the Cape Plumbago. They are inflated between the veins so that they seem a bit curled. The flowers of the type are purplish red whereas those of the variety are scarlet.

Use. The Cape Plumbago is commonly used at the base of pergolas, posts and fences but the plants may be pruned formally or for hedges. Caroline Elizabeth Strong says the the beggars of Asia use the roots to produce loathsome sores which they use to excite pity and alms.

Scarlet Plumbago needs a greenhouse because few places in Southern California have a high enough night temperature. When cut, the flower colors glow under artificial light.

Culture. The plants like the sun and are drought resistent but moisture tolerant. They stand ocean winds and prefer plenty of space to grow.

Pruning. Prune the plants heavily after flowering and prune severely for rejuvenation every three or four years.

Beverly Nichols' "Merry Hall" becomes a library must when viewed through Miss McLouth's eyes.

New Books

ADA MCLOUTH

MERRY HALL, by Beverly Nichols. New York, Dutton, 1953.

Whoever read "Down the Garden Path" 20 years ago, and then, in order, "A Thatched Roof" and "Green Grows the City," will inevitably want to read "Merry Hall." In it he will find similar experiences and the same antipathies dwelt on before. Once the taste for his blend is formed, we are happy to indulge it whenever Beverley Nichols gives us the chance to experience with him the planning and planting and enjoyment of a garden.

"Down the Garden Path" through several editions has reflected for many readers their own experiences as novices in the endless art and toil of garden making. B. N.'s gayety and enthusiasm do not hide the fact that he "was learning all the time . . . learning to keep step with the slow and lovely rhythm of nature."

"A Thatched Roof" took us inside the Tudor cottage he lived in when he wrote "Down the Garden Path," but we are conscious of the garden surrounding it, particularly in such chapters as "Rain On the Roof" and "Leaves at the Window."

"Green Grows the City" finds B. N. back in London, where he laid out and brought to maturity a city garden in a forlorn triangle of desolation, the back yard of a house in Hampstead. For the apex of the triangle he designed an unusual garden structure crowned by a glass dome, surrounded at its base by geraniums. The flower-bordered dome he likened to Queen Mary's hats. It was a fantastic and fragile bubble put up just six months before the lights went out and the guns began to roar. The beautiful photographs show the bare area he started with and the various steps in converting it.

After the war years B. N. again found it necessary to wrap himself in a garden and the place he found was Merry Hall, about an hour's drive from London, a Georgian mansion in a state of dilapidation and neglect that gave full rein to his zeal for creating something beautiful. With the house came the gardener, Oldfield, a crusty type, but skillful and faithful.

Some of the adventures related in "Merry Hall" are: the planting of a wood, growing trees from seeds, introducing water into the garden picture, and finding and placing garden ornaments.

As in all his books, we find charming little essays on plants and flowers, sometimes those most familiar, to California gardeners, such as bougainvillea, or mimosa, plants which, with a great sense of triumph, he grows in a greenhouse.

In "Merry Hall," as in his other books, there are frequent digressions, often on the subjects that make him peevish. Some of these subjects are: women, the laboring classes, women as flower arrangers, the Chancellor of the Exchequer, women about the house, the Welfare State, women . . . The digressions—and the peevishness—are entertaining.

The drawings by William McLaren, like those by Rex Whistler in the earlier volumes, are a delightful feature of the book, suggesting with charming delicacy the spirit of the place.

The savor of Beverley Nichols may be sampled in such bits as:

Rain: Any good gardener will know what I mean . . . when the rain comes, after a drought, he is *himself* the thirsty soil. — A Thatched Roof.

Everlasting flowers: They have eternal youth. And if you take them to your heart, something of that youth will flow through their strange dry petals into your own heart.—A Thatched Roof.

Bees:: If Mozart could have written an overture for the bees . . . —A Thatched Roof.

Geraniums: Well, I love geraniums, and anybody who does not love geraniums must obviously be a depraved and loathsome person.—Merry Hall.

Fragrance: To be "overpowered" by the fragrance of flowers is a most delectable form of defeat.—Merry Hall.

Bonfires: I have never yet met a boring bonfire, nor failed to find a plausible excuse for making one.—Merry Hall.

Wit, sentiment, nostalgia, venom, are ingredients in "Merry Hall" as in the above-mentioned books, all regrettably out of print in this country.

Beverley Nichols loses all sense of restraint when he writes about flowers. If you lose all sense of restraint when you read about flowers, you can lose it all over Beverley Nichols on gardens, keep his books on the shelf and turn to them with anticipation that is seldom let down.

Some timely advice from Mrs. Calloway concerns those queens of the summer lath house, begonias.

Begonias

Ethel H. Calloway

There seems to be a great horticultural interest in begonias, and Southern California is no exception. In this vicinity there has been accumulated a large collection of begonias, divided in three classes — fibrous, rhizomatus and tuberous. The fibrous rooted should be of particular interest to the amateur, as they are suited for cultivation in the green house, lath house, sunporch, or in the ground as part of the landscape scene. Most fibrous begonias are evergreen and do not lose their foliage as the other types frequently do. However, one should keep a watchful eye to see that they neither dry out completely, nor keep too wet, but are just pleasantly damp. They should be repotted whenever they have completely used their potting mixture. It is better to repot when the plant is thriving, and in generally good condition. An ailing specimen should either be made into cuttings or placed in cutting bed as a complete plant.

I don't believe there is any such thing as a "green thumb," but feel that it is intelligent care and devotion that pay off. Watch your plants carefully for any indication of disease or pests. There are several new sprays on the market that really take care of your problems now, especially a new wonder fungicide that banishes mildew like magic.

It is very desirable that one be acquainted with his own plants, not only their proper cultivation, but also their names. It would be nice to have them tagged so that friends and visitors could easily identify them.

Begonias succeed best with a night temperature of 55° and a daytime rise to 60° or 65°. They like a moist, buoyant atmosphere, not stagnant.

San Diego is famous for some of the finest hybrids. Let's not be content with inferior introductions in the future, but try to perfect those that have been proven so worthwhile. I'm afraid that those that are not distinct will only add to the confusion now prevalent.

Bailey's Encyclopedia has some interesting data about begonias: some South American species are used as rhubarb; the rhizomes are bitter and astringent and are used for fevers and syphilis. Some species contain purgative principals.

I find it a great inspiration to visit lathed gardens, attend shows, see specimen plants at regular Begonia meetings, and read the articles in the Begonian—a fine national magazine, issued monthly, that all shade garden lovers will thoroughly enjoy. I wish all begonia fans a "bang up" summer, enjoying your own plants and those of your friends and neighbors.

Garden clubs cover the county, and one of the most civic-minded is the Pacific Beach Garden Club.

Pacific Beach Garden Club

Margaret Van Sickle

Pacific Beach, California is a comparatively new community of approximately 35,000 population in San Diego County, bordering the Pacific Ocean, north of Mission Bay and south of La Jolla.

The climate ranks second in the United States. Its cooling ocean breezes make the days comfortable all the year round.

The majority of the homes are owned by people of moderate circumstances. A thriving business section covers nearly three miles of the main street. Many apartments are under construction. Facilities for boating and swimming are close at hand to tempt the tourist. There are 17 churches in Pacific Beach providing excellent religious training. Three new schools are being built—two Elementary and a Senior high. In addition there are two Elementary and one Senior high in existance. The prospects of an enlarged recreation center should stimulate interest and encourage character building in our youth.

The Pacific Beach Garden Club, consisting of 38 members interested in beautifying private and community property, is now actively engaged in a beautification program. In conjunction with the local Lions Club and other interested organizations, a community-wide tree planting program has been undertaken. A thorough survey was made of every street by a competant horticulturist. His recommendations for street trees were then submitted to the planning commissioner of San Diego. A few changes were made by the commissioner and an approved plan is now ready to be carried out. To date 167 trees have been planted on one street. Other streets will be planted when funds and trees are available. Money is being raised by contributions. The Garden Club has given a sizable donation to this fund. Each member has been responsible for his or her share, raising the money by their own talents. Luncheons were served to the members of the Lions Club doing the actual planting. Our aim is to have a tree in the parkway spacing of every home in Pacific Beach.

Other projects to be undertaken by the Garden Club in the near future are:

1. Participation in the local Memorial Day Parade.

2. Supervising the planting of the grounds at the Recreation Center.

(from page 5)

Helianthemum scoparium, pronounced hee-lee-anth-e-mum scopar-ium, is our member of the Rock-rose Family, and has the common name of Rush-rose. It is a distant cousin of Cistus of our gardens and is in no way related to the true roses. This somewhat woody perennial sends up many erect leafy stems, and from May through July produces a wealth of sunny yellow flowers. The Rockrose is widely distributed throughout the park and adds its bright bloom to the other floral display of the summer.

The Heath Family is represented by two species of Manzanita, a Spanish word meaning "little apple," because the immature fruits of these plants do somewhat resemble small green apples. *Arktostaphylos tomentosa,* pronounced ark-toe-staff-e-los toe-men-toe-sa, Wooly Manzanita, is a low growing, prostrate form of Manzanita with smooth dark red bark. *Arctostaphylos bicolor,* Mission Manzanita, is a densely branched shrub, three to eight feet high, and one of the dominant plants of the park.

Brief mention must be made of the four members of the Cactus Family, important exhibits in the floral display. *Opuntia prolifera,* Cholla Cactus, grows along the seacliffs and sends up several round stems, two to four feet high, with numerous spreading branches. The flowers are ruby-red and set among a silvery sheath of sharp spines; the fruits develop in a chain-like formation and are light yellow when ripe. *Opuntia littoralis,* Coast Prickly Pear, like the Cholla, seems to prefer the seaward portion of the park and may be seen in the canyons and along the slopes. At this season of the year it is adorned with large flowers colored in varying shades of yellow. Later the bright red fruits will attract the birds to bountiful repasts.

Echinocactus viridescens, Green Dwarf Barrel Cactus, produces a coronet of yellow flowers, followed by pear-shaped yellow fruits.

Mamillaria dioica, Fishhook Cactus, or Strawberry Cactus, is a chubby little plant with many hooked spines. Its flowers are less than an inch long and yellowish-white; the fruits are scarlet with black seeds.

There are other flowering and fruiting in plants which will be described in Fall Number of CALIFORNIA GARDEN.

Making easier your—

Garden Chores

Ada Perry

The quote from Mark Twain I'm thinking about, has nothing to do with the weather. It's just Huck Finn's remark about the hungry lions in Africa, after he swung up into the sky to the balloon and they stood below looking so hungrily up at him. He was a meal they'd missed and Huck said it was as much as a body could do not to see their side of the matter. So—you are following me, aren't you?—it's as much as a body can do not to see peppy little bugs', caterpillars', beetles' and infant snails' side of things. I am never, never going to study life cycles of insects. I know darn well they'd be too interesting for the good of the garden.

Alice Greer started all this. She suggested writing about all the little busy bugs and things of summer, that eat and eat. And I will—there have been some very good bugmen around this spring —but it's as much as I can do not to see the bugs' side of things. That expression "bugmen" can be easily explained. Frogmen catch frogs, bugmen catch bugs. Simple.

The thing is if you like to use new type insecticides, use also discretion. Some of the bad effects can happen to you. So for caterpillars, red spiders, mealy bug and thrip, you might apply the atom-bomb-contemporary sort of remedy exactly according to directions if you feel it's necessary. But you would not use it continuously, and you would bear in mind that its bad effects on you, if any, can occur through skin contact.

The most interesting of the bugmen discussed the new weapons in insect warfare at some length —the first time I realized "phosphate" can be a deadly word—and then ended up with a rousing cheer and a tiger for guess what? Pyrethrum and rotenone. Remember the interest these ingredients aroused when they were rather new? The bugman says they have stayed right where they always were. Harmless to man, "cyanide" to insects. And furthermore, insects have never set up any resistance to them. This doesn't seem so surprising—after all they're not supposed to—until you're informed the durn insects can and do set up resistances to the war-born materials of the twentieth century.

Of course it behooves me not to ignore the fact that those materials can clean up messes of red spider, mealy bug and scale in one application that might take something else a year to accomplish. And that's just the point. For the home operator, in an emergency and with every precaution.

About the resistance business. The thing is to switch remedies on such crises as lawn moths. Chlordane one time, DDT another. This, you bellow—and with justice — keeps you buying something new all the time. Well, buy in smaller quantities. Most of the stuff is better when it's freshly opened, anyway.

The pyrethrum and rotenone materials are great for the organic gardeners' programs. They were both developed from organic sources—plants. Synthetics have since been produced but the source was organic.

There was something interesting about Blackleaf 40 and soapsuds in the bugman's remarks. It isn't, he said, that soapsuds make the Blackleaf stick better—it's just that soapsuds make it more volatile. That's the thing to shoot for in blackleaf and so you should always choose a warm day if you want to use it.

In tomato troubles, which we are well supplied with in summer, there was this point. A fungus blight hits the bigger, older leaves and there are brown spots on them. And you may arrest the trouble with a fungus remedy or even prevent it with same if applied in time. But a virus blight affects the top and tip growth, the young leaves, and you can pull "oop" the plant and worry no longer. Virus blight has to be bred out of the strain and though they have made great improvements, they don't have a 100% score yet.

A few other choice remedies for nature's bounty in summer are rustling bird scares and shot guns for rabbits, lindane for sowbugs, cheesecloth for fruit "pigs" with wings, scissors for grasshoppers and bombs for gophers. And lots of people don't like to do it. They talk about it now and then. Although I've only heard one lady express sympathy for sowbugs. She said they didn't seem to be doing any harm. (Lots of times that's true. Other times they fall into bad company and do some bad gnawing.)

A great preventive for spraying all the time with remedies is the morning shower with water. Everybody realizes it cleans up the plants and refreshes them. But the odd thing is, it knocks off the enemies and exposes them to *their* enemies. No mocker is going to wear himself out looking for bugs in the morning if you'll send them tumbling out in full sight with your hose. As for tough caterpillars — Charlie Dibb down where I work says look for the egg clusters and busticate them before they crawl away.

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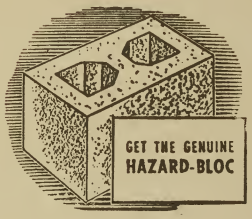

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